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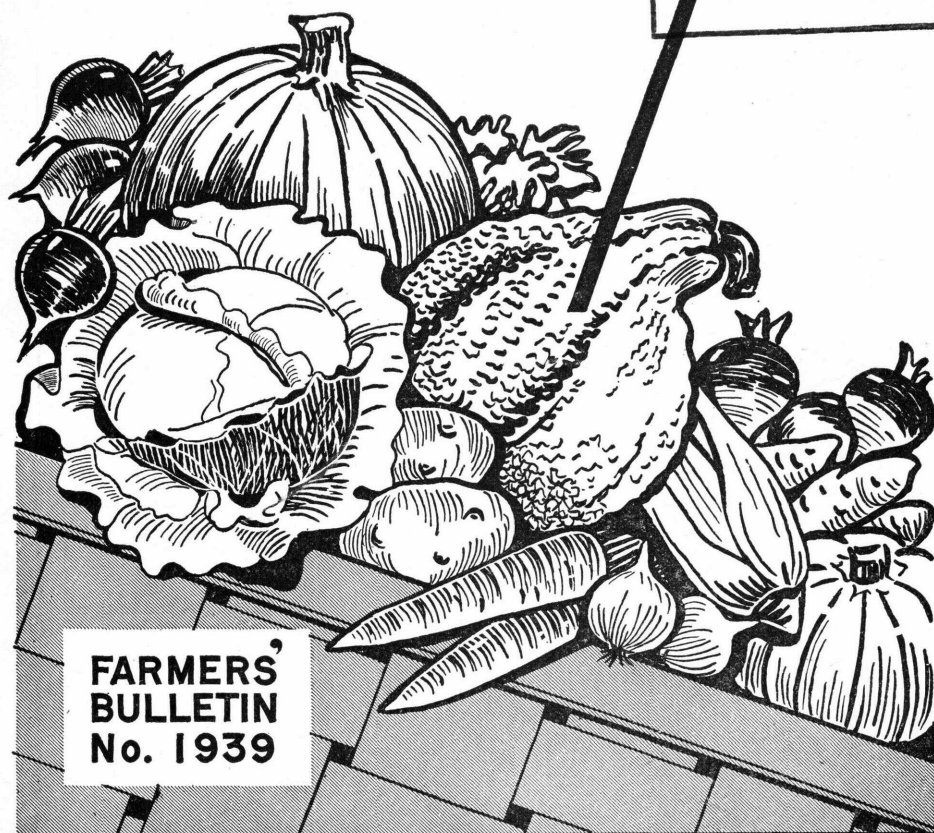
Home ^A Storage

OF VEGETABLES AND FRUITS

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U. S. DEPARTMENT OF AGRICULTURE



FARMERS'
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No. 1939

U.S. DEPARTMENT OF AGRICULTURE

CONSERVATION OF FOOD by the home storage of vegetables and fruits is an economy of prime importance in wartime. Such products can be stored most economically when grown in sufficient quantities at home to supply the needs of the family. They can also be stored to some extent by those who have to purchase them on the market.

Existing space in or near the home can generally be found for storing the surplus produce. When large quantities of fruits and vegetables are grown, it may frequently be advisable to construct a permanent storage room in the basement of the dwelling or under an outbuilding or to build an outdoor cellar of wood or masonry as described in this bulletin. But if permanent storage space is not available, root crops, certain other vegetables, and apples and pears can be stored in pits, or banks.

Detailed directions are given for handling fruits and vegetables that can be stored at home, both on the farm and in cities and towns. Combinations to be avoided and produce that cannot be stored at home are mentioned.

This bulletin is a revision of and supersedes Farmers' Bulletin 879, Home Storage of Vegetables.

HOME STORAGE OF VEGETABLES AND FRUITS

By JAMES H. BEATTIE, *senior horticulturist*, and DEAN H. ROSE, *senior physiologist*,
Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry,
Soils, and Agricultural Engineering, Agricultural Research Administration

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CONSERVATION OF FOOD is properly emphasized during the present national emergency when health-giving diets for maximum efficiency are being stressed. Therefore, American families must not waste food crops but should provide themselves with supplies of those that may be scarce and expensive after the growing season is past.

For those who are fortunate enough to control sufficient land to grow practically all the vegetables and fruits the family needs, storage will prove particularly advantageous. Crops of suitable sorts that mature at a season when they can be preserved by storing should be kept in their natural condition instead of being canned or dried. Not only is it possible to reduce the cost of meals materially by growing and storing vegetables and fruits for home use, but the satisfaction and dietary advantage of having a supply of fresh produce near at hand, so that regardless of market conditions and winter temperatures the menu may be varied, cannot be measured in dollars and cents.

A half-acre garden, if cared for properly, will produce far more vegetables than the average family can consume during the maturing period of the crops. Only a small portion of the garden should be devoted to those crops that must be used as soon as they reach



FIGURE 1.—Vegetables, apples, and pears in a storage cellar that is walled off from the basement and has an outside window for ventilation and cooling. The peppers, eggplant, and onions shown are to be stored only a short time. Apples, cabbage, and potatoes should not be stored together unless storage space is limited, as the apples will absorb the vegetable flavors.

maturity. Late cabbage, celery, onions, also potatoes, sweetpotatoes, parsnips, turnips, and other root crops may be stored in their natural condition and should be grown to the extent of the family needs for storage for winter use. Beans of various kinds, including the limas, may be stored dry. The successful storage of vegetables is not at all difficult; in fact, good storage facilities already exist in many homes, it being only necessary to make use of the cellar (fig. 1), a large closet, or other parts of the dwelling, depending upon the character of the produce to be stored, and to take reasonable care to discard all individual vegetables showing any decay or mechanical injury before putting them into storage. Fruits that can be held in home storage are discussed on pages 23 and 24.

FACILITIES FOR HOME STORAGE

Different vegetables require different storage conditions; as a rule vegetables dry out or wilt or wither rather quickly unless the atmosphere of their storage place is kept damp and the temperature as low as possible without actual freezing. Certain vegetables, however, are exceptions to this rule, as will be noted later.

Some attention will necessarily have to be given to ventilation. Ventilation is needed in a storage space not only to change the air to carry off odors but also to help maintain a desirable storage temperature and humidity. Advantage should always be taken of the cool air at night and at other times when the outside temperature is near but not below freezing and the air is not too dry.

A STORAGE ROOM IN THE BASEMENT OF THE DWELLING

A cool, well-ventilated cellar under the dwelling offers good conditions for the storage of vegetables and some fruits. Many cellars are not well suited for storing vegetables because of poor insulation or lack of ventilation. Cellars containing a furnace for heating the dwelling usually are too warm and too dry for the storage of root crops, but if no other storage place is obtainable root crops can be stored there for 3 or 4 weeks (see pp. 26, 27). It is often possible, however, to partition off a room either in one corner or at one end of the cellar where the temperature may be controlled by means of outside windows. At least one window is necessary, and two or more are desirable for cooling and ventilation. If the cellar is square or rectangular, a room similar to the one illustrated in figure 2 can be arranged. If, as is often the case, the cellar is built in the shape of an ell, the room should be made by partitioning off the offset, as shown in figure 3. In some cases it is possible to cut off one end of the cellar with one straight wall. Ventilation may be obtained by opening one or more windows. The windows in the storage room should be

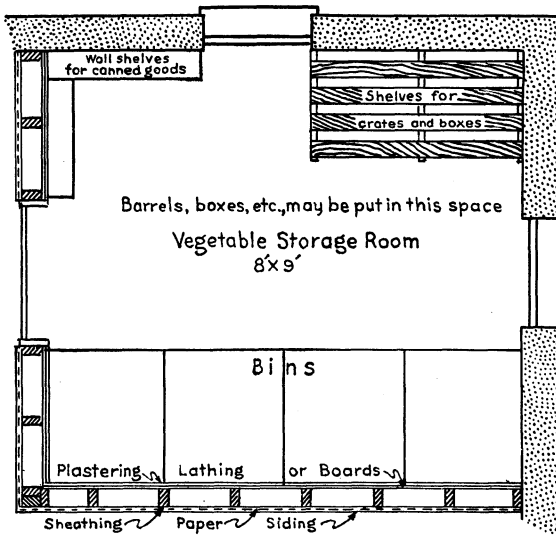


FIGURE 2.—Floor plan of a storage room in a corner of a basement. The arrangement of the shelving and bins may be changed to suit conditions. While the construction of the wall may be varied, it must be tight.

darkened in order to protect the vegetables from light, and they can be boxed in or shaded in such a way as to prevent the entrance of light when they are open.

The size of the storage room should be determined by the space available and the amount of material to be stored. Natural earth makes a better floor than concrete or brick, as a certain amount of moisture is desirable and earth floors are easier to keep damp by occasional sprinkling if this seems necessary. The walls of the storage room should be parallel to those of the cellar. Fasten 2- by 4-inch scantlings, laid flat, to a light concrete footing. Concrete construction where practicable is good insurance against damage by termites. Set 2- by 4-inch studs from this sill to the ceiling, spacing them 16 inches apart from center to center. Locate the door to the storage room at the most convenient point, making it large enough to admit barrels, boxes, etc., a good size being $2\frac{1}{2}$ feet wide by $6\frac{1}{2}$ feet high. Set the studs on either side of the door 32 inches apart; this will allow for the door and the frame. Put a header over the door, allowing 1 inch for the frame and seven-eighths of an inch for the sill at the bottom. Set the studs against the walls where the cellar walls and storage-room walls meet. Care exercised in making the frame square and plumb will enable the builder to get the structure tight with a minimum of labor. A good room is made by covering the studs on the outside with tongue-and-groove material, but a better way is to sheathe the outside with plain lumber, tack building paper on this, and side with tongue-and-groove material. This construction in connection with lath and plaster or wallboard on the inside makes an excellent room. The construction of such a wall is illustrated in figure 4.

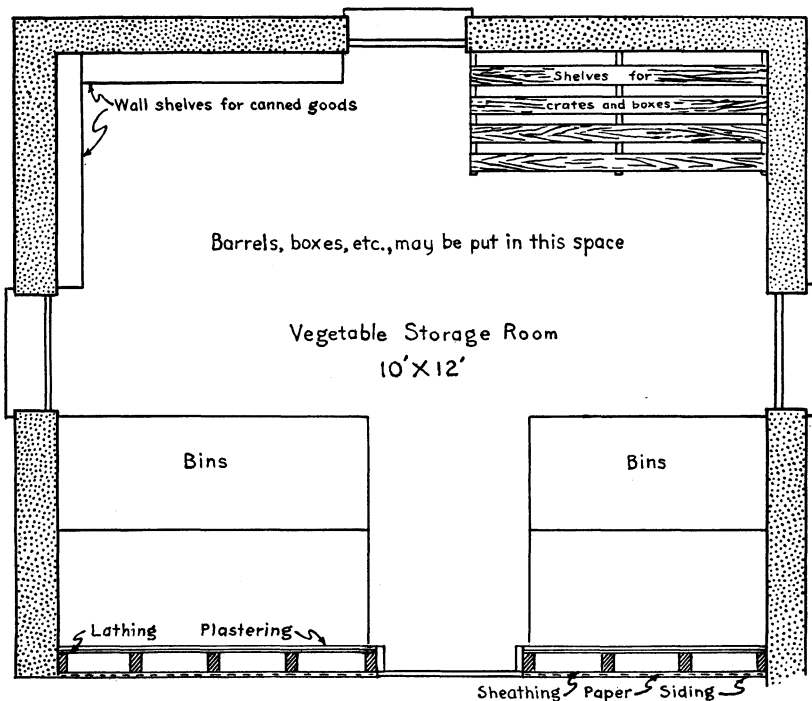


FIGURE 3.—Floor plan showing the possibility of constructing a storage room by partitioning off the part of the cellar under the wing of the house.

Barrels, crates, boxes, or bins may be used as containers for the various vegetables and fruits, but movable containers are preferable to built-in bins, as it is possible to remove them for cleaning. It is advisable to construct shelves or a slat floor to keep the crates, boxes,

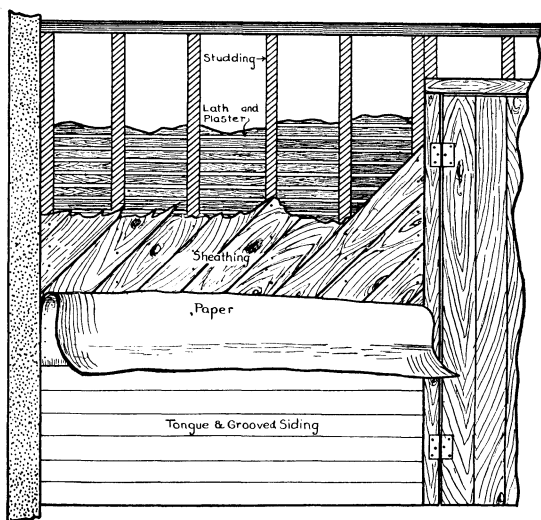


FIGURE 4.—Wall of a storage room in a basement, showing the details of construction. This type of construction is good, but a satisfactory room can be made by omitting the laths and plaster. Many rooms with studding frame and tongue-and-groove siding give excellent results.

baskets, and other containers off the ground. This is desirable to insure circulation of air and to prevent the containers from harboring mice, rats, and other vermin. The air, however, must be kept moist at all times. The shelves for canned goods along one side of the room need not be more than 6 inches wide. Suggested arrangements for the bins, shelves, etc., in the storage room are shown in figures 2 and 3.

A STORAGE CELLAR UNDER AN OUTBUILDING

Sometimes it is possible to build a storage cellar as the lower story of and foundation for an outbuilding such as a barn. When this is done, it is desirable to have the cellar almost entirely underground and well insulated by banking the outside walls with dirt. The ceiling of the cellar should be insulated. This may be done by sheathing the under side of the ceiling joist with tongue-and-groove siding and filling the space between the joists with dry sawdust or with shavings. Peanut, rice, and cottonseed hulls, if well dried, are also effective. Concrete is a good material of which to construct the side walls of the cellar, although brick, stone, or tile may be used. The entrance may be through the floor of the room above or through an outside door placed in one end of the cellar, reached by steps or a grade entrance. Ventilation may be obtained by running a ventilating flue from the ceiling of the cellar through the room above to the roof or by placing ventilators in the side walls near the ceiling. Inlet ducts should be put in the floor as in outdoor concrete cellars, and their outer ends should be covered with wire screen.

OUTDOOR STORAGE CELLARS

Outdoor storage cellars or caves are excellent for the storage of many vegetables and some fruits. They are particularly desirable on the farm, as they afford convenient and inexpensive storage facilities for surplus vegetables that otherwise might be lost. They possess all the advantages of a storage room in the basement and are superior in many respects. The outdoor storage cellar can be maintained at a uniform temperature over a long period. It is possible to keep the cellar cool and quickly to reduce the temperature of the stored produce to the desired point for safe storage by opening the door during the night and closing it in the morning before the air becomes warm. All ventilators should likewise be kept tightly closed until the outside air is again cooler than that within the cellar, when they should be opened, unless the outside temperature is so low as to be dangerous. This safeguards the produce and adds to the efficiency of the storage chamber. Vegetables can be more conveniently placed in such a cellar than in a storage room in the basement of a dwelling.

When the chief use of the outdoor storage cellar is for storing turnips, beets, carrots, and other root crops commonly used as stock

food, it should be located near the stable, where the material will be convenient for winter feeding. When it is to be used for vegetables for the table, the cellar should be accessible from the kitchen at all times. If apples or other fruits are to be stored in an outdoor storage cellar, it is desirable to have a two-compartment cellar, one for vegetables and one for fruits, with separate intake and ventilating flues in each compartment.

As the cellar must be weatherproof, that is, capable of being kept free from moisture and free from frost, its type and construction vary with the geographical location. In the southern part of the country the structure is usually entirely above ground and protected by only a few inches of sod and by straw, hay, or leaves. In northern sections outdoor storage cellars are made almost entirely below ground and covered with a foot or two of earth.

Storage in Regions With Mild Winters

An above-ground storage cellar suited to conditions in southern sections of the United States may be built on a well-drained site at low cost. A row of posts may be set 5 or 6 feet apart, extending 7 or 8 feet above the surface of the ground, with a ridge pole placed on top of them. Against each side of the ridge pole a row of planks or puncheons is placed, with their opposite ends resting in a shallow trench 4 or 5 feet from the line of posts. The ends are boarded up, a door being provided in one end of the structure, and the roof covered with sod to a depth of 5 or 6 inches. A good type of outdoor storage cellar built along these lines is shown in figure 5.

FIGURE 5.—An outdoor storage cellar typical of those used in the South for storing sweetpotatoes and other root crops. It consists of a pole and a plank frame covered with sod and straw.



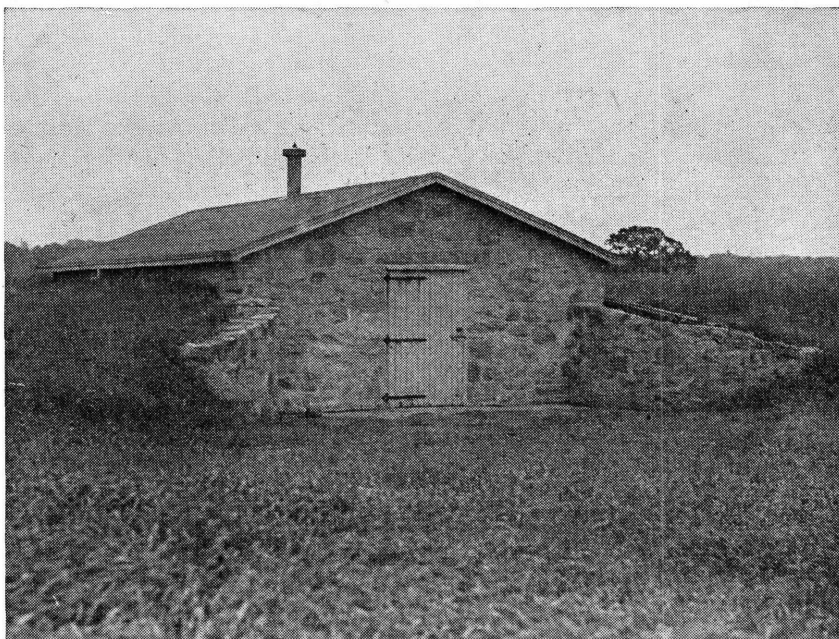


FIGURE 6.—A storage cellar adapted for cold climates. Note the ventilator.

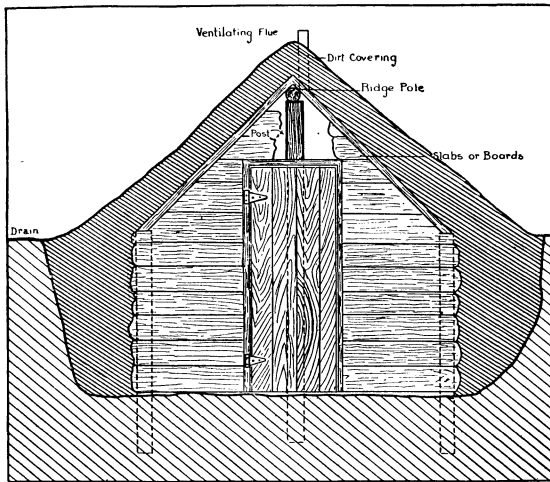
Storage in Regions With Severe Winters

Outdoor Storage Cellars With Wood Frames

In sections where low temperatures prevail, it is necessary to insulate the storage house so that the produce will not freeze. An above-ground type of storage house much used in many sections of the North has thick walls filled with insulating materials, such as sawdust or shavings. The construction is of frame, and the walls are usually 10 to 12 inches thick. Both the inside and outside walls are sheathed with matched lumber so as to make them as tight as possible. The rafters are ceiled on the under side with the same material, and the space between the rafters is filled with dry insulating material. The use of building paper in the roof and walls of the storage house is of great assistance in making the structure as tight as possible. Ventilation is provided in the same manner as in the outdoor storage cellar built of concrete described on page 10. A further improvement designed to keep the insulating material dry is the use of vaporproof insulating paper on the inner side of the insulation.

A type of storage cellar much used in northern sections of the country is built partly underground. The walls are of masonry and extend to a point just above the surface of the ground. On these walls plates are set, and a roof of frame construction is erected. The roof structure is ceiled on the under side of the rafters and some suitable

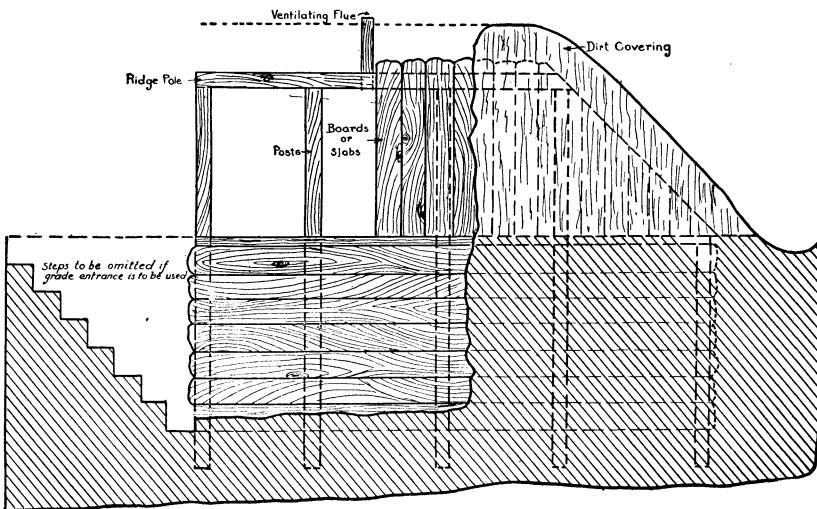
FIGURE 7.—End view of an outdoor storage cellar showing the frame of posts covered with planks or puncheons and with soil. Additional protection may be given by placing manure, straw, or corn fodder on top of the dirt.



insulating material, such as dry sawdust or shavings, is packed in the space between the rafters, and then the sheathing, paper, and roofing material are applied as in the case of the above-ground type of storage cellar described in the previous paragraphs. This type of structure (fig. 6) is preferable in many respects to the above-ground type, as it is easier to maintain the temperature at the proper point and its insulation is a comparatively easy matter.

Protection from freezing may be obtained with a simpler type of structure (figs. 7 and 8) by making it entirely or largely underground.

FIGURE 8.—Side view of an outdoor storage cellar, showing the details of construction. If the cellar is more than 12 feet long two ventilating flues should be used. If it is built on a sidehill no steps will be needed, and it will be easier to store and remove the produce.



In order to avoid steps down to the level of the floor, with the consequent extra labor in storing and removing the produce, a sidehill location is desirable.

The excavation in the hill should be of the approximate size of the cellar, the soil being used for covering the roof and for banking the sides of the structure. A frame is erected by setting two rows of posts of uniform height in the bottom of the pit near the dirt walls and a third line of posts about 5 feet higher through the center of the pit. These posts serve as supports for longitudinal plates on which are laid the planks of puncheons forming the roof of the structure, as with the above-ground type of storage cellar already described. The door is placed at one end, and a ventilator is put in the roof. The whole structure with the exception of the portion occupied by the door is covered with soil and sod. The thickness of the covering must be determined by the location; the colder the climate the thicker the covering. The dirt covering may be supplemented in winter by a layer of manure, straw, corn fodder, or similar material. Outdoor storage cellars usually are left with dirt floors, as a certain degree of moisture is desirable. These cellars may be made of concrete, brick, hollow tile, stone, or other material.

Outdoor Storage Cellars Built of Concrete

The type of outdoor storage cellar just described, although low in first cost, is short-lived, as the conditions in the cellar are favorable to the decay of wood. The concrete storage cellar, although rather high in first cost as compared with one of wood, is a permanent structure. Concrete possesses several advantages over brick, stone, or other decay-resisting materials. In the construction of a small structure suitable for home use, it is possible to make the roof self-supporting and to employ unskilled labor, thus lessening the cost. It is a simple matter to waterproof concrete, a feature highly desirable in a storage cellar.

For detailed information in reference to the mixing and handling of concrete, the reader is referred to Farmers' Bulletin 1772, *Use of Concrete on the Farm*.

The site for the concrete storage cellar should be selected with the same considerations in mind as for the wood-frame cellar, namely, a well-drained, convenient location, preferably a sidehill, into which it may be built, as shown in figures 9 and 10. The excavation should be just large enough for the dirt walls to serve as the outside form for the concrete. For that portion of the wall which is above the surface of the ground a board form must be used. The inside form usually is made of boards held in place by scantling spaced about 18 inches apart. Temporary supports should be placed across the top to carry the form, so that it will be of the size and shape desired. The side walls and roof

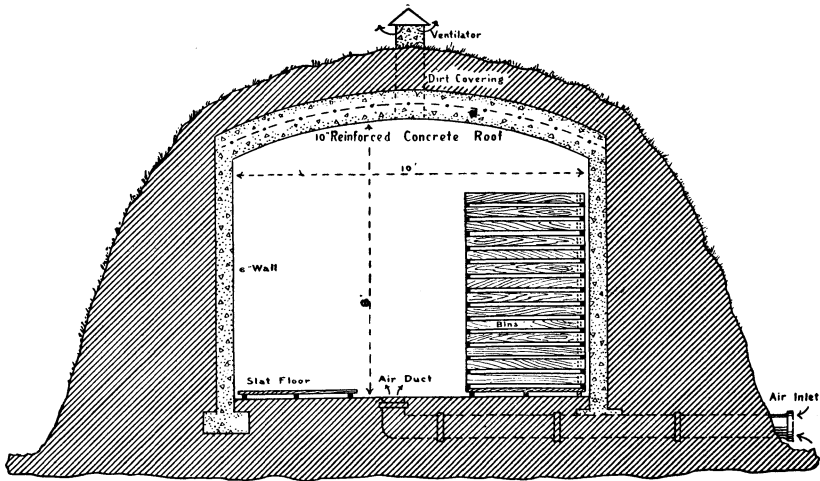
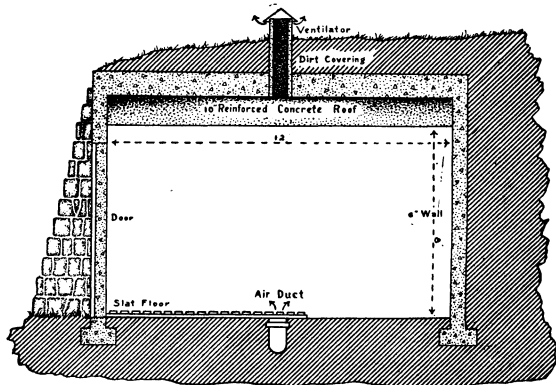


FIGURE 9.—Cross section of a concrete storage cellar, showing the arrangement of ventilators, slat floors, and bins, with provision for the circulation of air under and around the slat floors and bins. This cellar is 10 feet wide and 8 feet high, inside measurement.

should be so constructed that there will be no joints to weaken the structure. The form for the ceiling may be slightly arched by setting a temporary line of posts through the middle of the excavation. A plate placed on these posts a few inches higher than the height of the side walls will allow the form boards to be laid crosswise of the cellar and the ends sprung down and secured to the forms for the inside of the walls. An arch a few inches high makes a strong roof and helps in ventilating the cellar.

The whole structure, with the exception of the portion occupied by the door, is covered with earth to prevent freezing, the thickness of the covering depending on the geographical location. In the colder sections of the country 2 or 3 feet is not too much, and additional protection may be given by using a supplementary covering of straw,

FIGURE 10.—Longitudinal section of an outdoor storage cellar 12 feet long, built of concrete. The structure may be lengthened to increase the storage capacity; if this is done, additional ventilators must be provided.



fodder, or manure. In severely cold weather both the top and bottom air ducts must be closed. It is well to cover the outside ends of the air inlets with woven wire, in order to prevent small animals from entering the storage cellar.

The cellar illustrated in figures 9, 10, and 11 is 10 feet wide, 12 feet long, and 8 feet high and will hold the produce of an acre garden. The walls are of 6-inch concrete reinforced by five-eighth-inch iron rods. The floor is earth, as this permits good moisture conditions for the storage of vegetables and fruits. The structure is provided with a ventilating flue in the roof and an air inlet in the floor for the admission of cool air. These ducts should be not less than 12 inches in diameter for a cellar of this size, but they may be partly or completely closed during severe cold weather. Glazed terra cotta pipe may be used for the ducts.

The storage capacity may be increased by making the structure longer, but when this is done, additional ventilators must be provided. If the width is increased, either middle piers should be used to assist in carrying the roof or the roof should be arched. A cellar 6 feet wide, 8 feet long, and 7 feet high will provide the necessary storage space for the produce of a small home garden and may be built in the same manner as the one illustrated in figures 9, 10, and 11.

STORAGE IN PITS, OR BANKS

Outdoor pits, or banks, are often used for keeping vegetables and sometimes winter apples and pears. The conical pit is used commonly

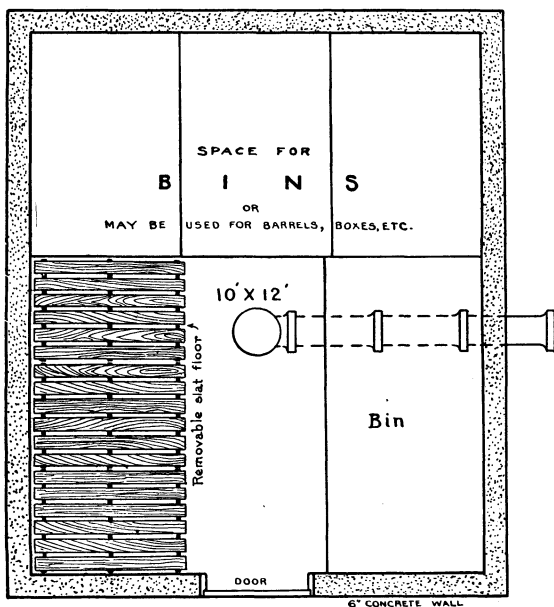
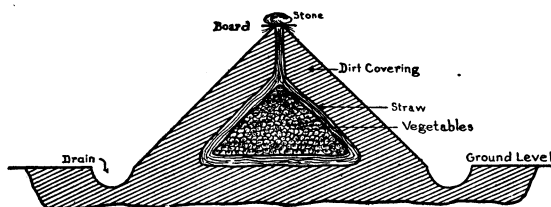


FIGURE 11.—Floor plan of a simple concrete storage cellar which may be used for potatoes, beets, carrots, turnips, rutabagas, and cabbage, or for celery and apples. The floor is of soil, but the barrels, crates, etc., used as containers for the vegetables, are set on a slat floor. Bins decay so quickly that barrels, boxes, etc., are usually preferable.

FIGURE 12.—Cross section of a storage pit containing potatoes. During severely cold weather the soil covering may be supplemented by manure, straw, or similar material.



for such vegetables as potatoes, carrots, beets, turnips, salsify, parsnips, and heads of cabbage and is constructed as follows: A well-drained location should be chosen and the produce piled on the surface of the ground. Or a shallow excavation of suitable size 6 or 8 inches deep may be made; this may be lined with straw, leaves, or similar material, the produce placed in the middle in a long or conical pile, the litter lining brought up over the sides and top, and the heap finally covered with earth to a depth of 2 or 3 inches. As winter approaches, the earth covering should be increased until it is several inches thick. The depth of the earth covering is determined by the severity of the winters in the particular locality. It is well to cover the pits with straw, corn fodder, or manure during severely cold weather.

The amount of ventilation necessary will depend on the size of the pit. Small pits containing but a few bushels of vegetables will receive sufficient ventilation if the straw between the vegetables and dirt is allowed to extend through the dirt at the apex of the pile. This should be covered with a board or piece of tin held in place by a stone to protect it from rain. In larger pits ventilation may be secured by placing two or three pieces of rough boards or stakes up through the center of the pile of vegetables so that a flue is formed. This flue is capped by a trough formed of two pieces of board nailed together at right angles.

Vegetables keep very well in such pits, but it is difficult to get them out in cold weather, so that when a pit is opened it is desirable to remove its entire contents at once. For this reason it is advisable to construct several small pits rather than one large one, and instead of storing each crop in a pit by itself it is better to place a small quantity of several kinds of vegetables in the same pit, so that it will be necessary to open only one pit to get a supply of all of them. In storing several crops in the same pit it is a good plan to separate them with straw, leaves, or other material. The vegetables from the small pit may be placed temporarily in the storage room in the basement, where they will be easily accessible as needed for the table.

The construction of a common type of storage pit is illustrated in figures 12 and 13; figure 12 shows the cross section of a storage pit containing potatoes and figure 13 one containing sweetpotatoes.



FIGURE 13.—A pit, or bank, of sweetpotatoes being covered with dry cane tops. Corn fodder, straw, leaves, or similar material might have been used.

Figures 14 and 15 show two stages in the making of a pit in which the vegetables are contained in a barrel. The successive layers of earth and straw (fig. 14) can be added as the weather becomes colder.

SANITATION IN THE STORAGE SPACE

Basement storage rooms and outdoor storage cellars or caves should be kept free of decaying material. At least once a year all movable containers and accumulated debris should be removed from the storage space, and any containers that have become dirty should be cleaned up. Thorough scraping and a good scrubbing, followed by whitewashing, are a practicable treatment.

In small home storages permanent bins are more difficult to clean and for this reason are less desirable than movable containers.

If pits, or banks, are used they should be made in a different place every year, to avoid decay in a new storage lot because of contaminated material remaining in an old pit.

HANDLING THE PRODUCE

Produce intended for storage should be handled carefully at all times to avoid bruises and skin breaks. All mashed, cut, or decaying specimens should be removed. If these precautions are not taken, serious loss from decay is likely to result, especially if the temperature in the storage space cannot be kept below 50° F.

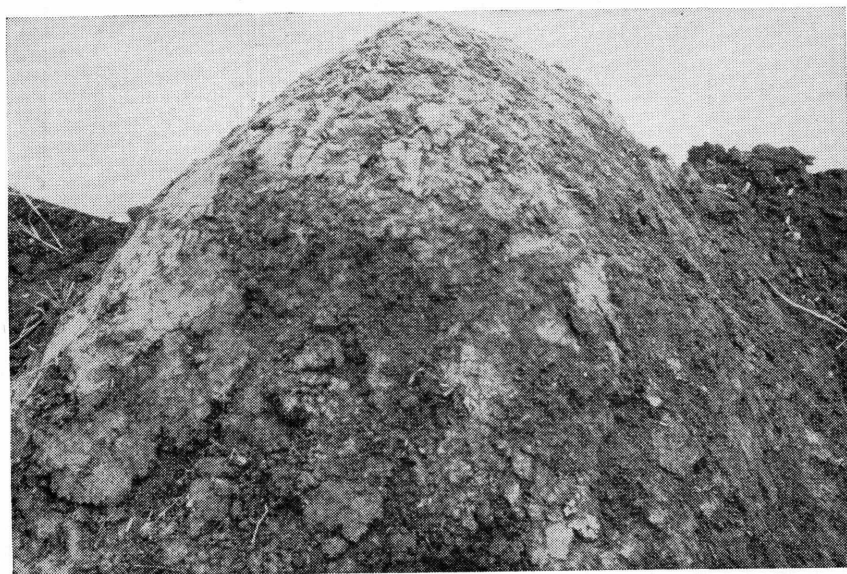
WAXING

Waxing of vegetables for home storage is ordinarily not recommended. It has been used for several years with certain perishable



FIGURE 14.—Home storage pit made by covering a barrel with straw and earth.

FIGURE 15.—Barrel covered with earth.



produce to improve its appearance for sales purposes and to prevent shrinkage from loss of water. It probably was used first on citrus fruits and then on rutabagas. Recently it has been tried on a number of other vegetables. On cucumbers and carrots it gives rather promising results.

STORAGE OF VEGETABLES

The conditions under which the vegetables commonly held in home storage will keep best are as follows:

- (1) Cool (below 50° F. but not low enough to cause freezing) and moist storage: Root crops, celery, cabbage, and potatoes.
- (2) Cool and dry storage: Onions and dried beans and peas.
- (3) Fairly cool and moderately dry storage: Pumpkins and squashes (50° to 60° F. and 70 to 75 percent relative humidity) and sweetpotatoes (55° to 60° F. and 75 to 80 percent relative humidity).

BEANS AND PEAS

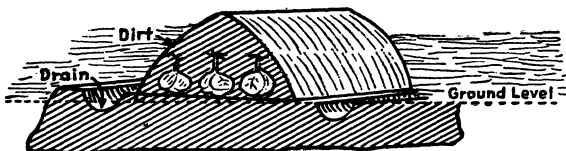
Beans may be kept for winter use by picking the pods as soon as they are mature and spreading them in a warm, dry place, such as an attic floor, until the beans are thoroughly dry. Then shell and store in bags hung in a cool, dry, well-ventilated place until needed. Do not store beans in cellars, as these are likely to be too damp. Allow navy and other bush beans to mature on the vines until a maximum number of pods are ripe; then pull the whole plant and cure it like hay. After thorough drying, shell the beans and store as suggested above or place them in fruit jars or cans. A few drops of carbon bisulfide in each container will make control of weevils more certain. This substance is inflammable and must be kept away from fire, but it will not affect the flavor of the beans or their germination.

Lima beans, soybeans, and peas may be treated like bush beans and stored in the same manner.

LATE CABBAGE

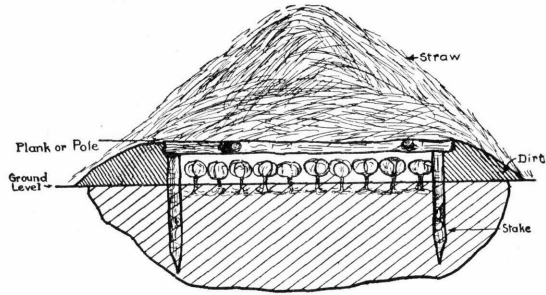
Heads of late cabbage may be cut and stored in conical pits in the same manner as root crops (p. 21). When the heads are cut, leave the roots in position, and in the spring these roots will sprout and supply the family with an abundance of greens.

FIGURE 16.—Cabbages stored in a long pit. Good drainage is essential, but the soil covering need not be as thick as for vegetables that are easily injured by frost.



Another common and very satisfactory method is to pull the plants, roots and all, and place them in a long pit with the heads down, as illustrated in figure 16. A few heads may be removed from time

FIGURE 17.—Cross section of a cabbage storage pen made of stakes and poles and covered with straw. This is a good way to store cabbage.



to time without disturbing the remainder of the pit. As slight freezing does not injure the cabbage, the covering of the pit need not be as thick as for other vegetables.

Another good method of storing cabbage is illustrated in figure 17. The plants are pulled, roots and all, and set side by side with the roots down in a shallow trench, the length of which corresponds to the width of the bed. The bed may be any width up to 8 or 10 feet and as long as necessary to hold the number of cabbages to be stored. Cover the roots with earth. Around the bed erect a frame of rails, boards, or poles, or by driving a row of stakes into the ground so that an enclosure about 2 feet in height is formed. Bank the outside of this frame with soil and place poles across the top, covering them with straw, hay, or corn fodder. Make provision for removing portions of the stored produce from one end of the pit. This type of storage is inexpensive and gives good results.

Heads of cabbage may be laid in rows on shelves in an outdoor storage cellar, as shown in figure 18, but not in a storage room in the basement of a dwelling, as the odor is likely to penetrate through the house.

For information on the storage of cabbage on a large scale, see Circular 252, Commercial Cabbage Culture.

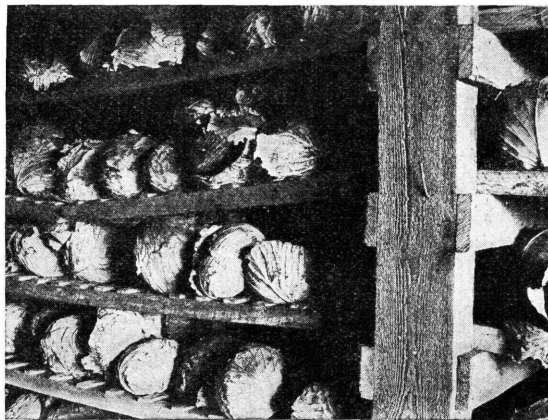


FIGURE 18.—Heads of cabbage stored on shelves in an outdoor cellar. The storage room in the basement of a dwelling should not be used, as the odor of the cabbage will penetrate the house.

CAULIFLOWER AND BROCCOLI

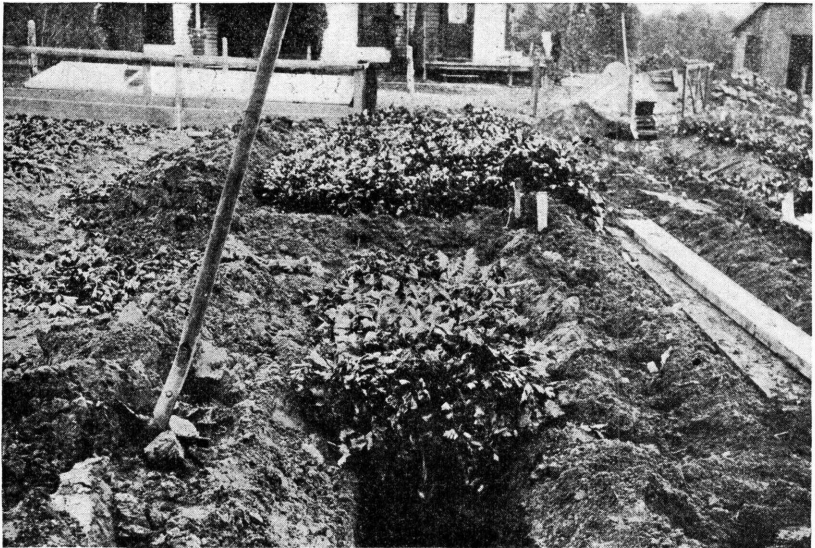
Cauliflower and broccoli are not adapted to home storage, but they can be held satisfactorily at 32° F. for a few days to 2 or 3 weeks.

LATE CELERY

Celery may be stored for a time in the position where grown by placing enough earth around the base of the plants to hold them in good form. Allow them to remain in this condition until just before severe freezing occurs; then bank the earth up to the very tops of the plants, almost covering them, and as the weather becomes colder cover the ridge with coarse manure, straw, or corn fodder held in place by means of stakes or boards. The celery may be removed as needed, but this method is open to the objection that it is hard to get the celery out when the ground is frozen.

Another method of storing celery, illustrated in figure 19, is to excavate a pit 10 to 12 inches wide to a depth of about 24 inches and of any desired length; thoroughly loosen the soil in the bottom or shovel in loose topsoil to form a bed in which to set the roots of the celery, and pack this trench with fully grown plants, placing the roots close together with considerable soil adhering to them. Water the celery as it is placed in the trench and allow the trench to remain open long enough for the tops to become dry. Unless the soil is very dry at the time of storing or extended warm weather should follow, it

FIGURE 19.—Celery stored in trenches. A 12-inch board is placed on edge along one side of the trench and cornstalks are placed across it, so that one end of the cornstalks rests on the board and the other on the ground.



will not be necessary to apply more water. Place a 12-inch board on edge along one side of the trench and bank it with the surplus earth; cover the trench with a roof of boards, straw on poles, or cornstalks from which the tops have been removed, placing the stalks across the pit with one end resting on the board and the other on the ground; spread over this a light covering of straw or other material which will pack closely, and as the weather becomes colder increase the covering to keep out the frost. Celery stored in this manner will keep until late in the winter. This method, because of its simplicity, is recommended for the farmer and small grower.

The unused pit of a permanent hotbed may be utilized as a storage place for celery by removing the surplus earth and substituting a covering of boards for the sash. Store the celery in the same manner as in the trench and cover the bed with any material which will keep out frost. Figure 20 shows a hotbed used for this purpose.

Celery may be stored on the floor of a storage room in the basement of a dwelling or in an outdoor storage cellar. Take up the plants just before freezing occurs, with considerable earth adhering, and set them on the floor with the roots packed together as closely as possible. If moderately moist, the celery will keep well under the conditions found in most storage cellars. Celery should not be stored in the same

FIGURE 20.—Cross section of a hotbed pit used for the storage of celery on a small scale.



cellar as turnips or cabbage, as it will absorb the odor of these vegetables, and its flavor will be ruined.

ENDIVE

Endive may be placed in the storage cellar under the conditions described in the final paragraph under celery (p. 19). The leaves are tied up over the crown or center to assist blanching.

ONIONS

To keep well, onions must be mature and thoroughly dry. Put them in ventilated barrels, baskets, crates, or loosely woven bags, as good ventilation is essential. A dry, well-ventilated place furnishes a good storage space for onions, as slight freezing does not injure them provided they are not handled while frozen.

For further information regarding the storage of onions, see Circular 278, *The Commercial Storage of Fruits, Vegetables, and Florists' Stocks*, and Circular 618, *Storage Quality of the Principal American Varieties of Onions*. (Circular 618 is out of print, but may be consulted in libraries.)

PARSNIPS

Parsnips may be left in the ground to be dug as needed, for freezing does not injure them. They actually improve in flavor after being kept near freezing for a few weeks. However, as it is a difficult matter to dig them when the ground is frozen, it is advisable to store a small quantity in the storage room in the basement of the dwelling or in the outdoor storage cellar for use during the periods when the ground is frozen. Parsnips may be stored in the same manner as other root crops (p. 21).

POTATOES

Potatoes are the most important vegetable in the northern part of the United States and are stored in large quantities for winter use. They may be kept in the storage room in the basement, in outdoor storage cellars, and in pits, or banks. When stored in cellars, the potatoes may be put into barrels, boxes, baskets, crates, or bins or on the floor, but they must be protected from the light. When stored in pits, or banks, they are handled in the same way as beets, carrots, and other root crops (p. 21). Potatoes must be protected from freezing; before winter sets in, the pit must be covered with manure, straw, or other material in addition to several inches of earth. It is a good plan to place the major part of the crop in pits, or banks, and a small quantity in the storage room in the basement or in the outdoor storage cellar for immediate use.

For more detailed information on the storage of potatoes, see *Farmers' Bulletin 847, Potato Storage and Storage Houses*, and Cir-

cular 278, The Commercial Storage of Fruits, Vegetables, and Florists' Stocks.

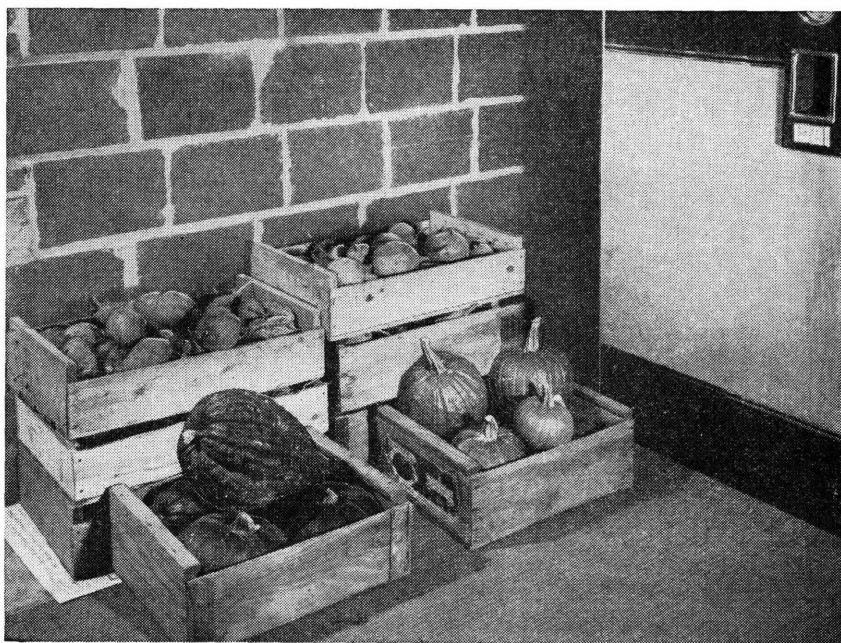
PUMPKINS AND SQUASHES

Well-matured pumpkins and squashes may be kept in the storage room in the basement, in dry, well-ventilated cellars, or, better, in the basement near the furnace (fig. 21). Put them in rows on shelves so that they are not in contact with each other. If the temperature is maintained at 50° to 60° F., late-maturing varieties of these vegetables will keep until late in the winter. A preliminary curing at 80° to 85° for about 2 weeks helps to ripen immature specimens and to heal mechanical injuries produced during harvesting.

ROOT CROPS

Root crops are not stored until cool weather of late fall. The roots should be pulled and the tops cut off when the soil is dry. If they are to be held in the storage room in the basement or in an outdoor storage cellar, they should be placed in ventilated barrels or loose boxes, or, better still, in crates. If sufficient space is available in the cellar, it is a good plan simply to place them in small piles along the wall. Storage in large piles should be avoided, as it is liable to cause heating and decay. Roots dry out and wilt very rapidly if kept too dry.

FIGURE 21.—Pumpkins, squashes, and sweetpotatoes in an ideal location for winter storage—near the furnace.



For storage in banks, or pits, prepare the roots as for storage in the room in the basement or in the outdoor cellar. Select a well-drained location, make a shallow excavation about 6 inches deep, line it with straw, hay, leaves, or similar material, and place the roots in a conical pile on the lining. Make the bottom of the pile about the same size as but not larger than the bottom of the excavation. Cover the roots with the same material as that used for lining the bottom of the pit and carry it up several inches above the apex of the pile of vegetables, having it extend through the dirt covering. This serves as a ventilating flue, and it should be covered with a piece of sheet metal or a short board as a protection from rain. The dirt covering should be 2 or 3 inches thick when the vegetables are stored, and it should be increased as severely cold weather approaches until it is a foot or more in thickness. In finishing the pit the dirt should be firmed with the back of the shovel in order to make it as nearly waterproof as possible.

A shallow trench should be dug around the storage pit, as shown in figure 12; it should have an outlet for carrying off promptly any water that collects. Supplement the dirt covering with manure, straw, corn fodder, or other protecting material. Use several small pits instead of one large one, as vegetables keep better in small pits and the entire contents may be removed when the pit is opened.

Turnips will withstand hard frost, but alternate freezing and thawing injures them. Gather, top, and store the roots in banks, pits, or an outdoor storage cellar. Do not place them in the storage room in the basement of the dwelling, as they give off odors that penetrate the house.

SWEETPOTATOES

Sweetpotatoes should be mature when dug and should be left exposed for a few hours for the surface moisture to dry off before they are placed in storage. They should be handled carefully at all times, as they are bruised easily. This crop may be kept in pits, or banks, or in outdoor storage cellars of the type shown in figure 5, but a warm, dry place is preferable. When stored in pits, or banks, sweetpotatoes are handled in much the same way as beets or other root crops. When kept in a specially constructed storage house, either in bulk or in crates, the sweetpotatoes should be cured for about 10 days or 2 weeks at a temperature of 80° to 85° F. For best results the humidity should be kept high during the curing process, but not so high that free water accumulates on the surface of the stored produce or the walls of the storage room. After the curing period the potatoes should not be handled further and the temperature should be reduced gradually to about 55° to 60° and maintained at that point or as near it as practicable for the remainder of the storage period.

When well matured before digging, carefully handled, well cured, and held at a uniform temperature of about 55° to 60° F., sweetpotato-

toes may be kept throughout the winter and spring. When only a few bushels of sweetpotatoes are to be stored, they may be placed in the basement (fig. 21), near the chimney on the second floor, or in any other place where the temperature will be about 55° to 60°.

For more detailed information on the storage of sweetpotatoes, see Farmers' Bulletin 1442, Storage of Sweetpotatoes, and Circular 278, The Commercial Storage of Fruits, Vegetables, and Florists' Stocks.

STORAGE OF FRUITS

Conditions suitable for the storage of vegetables answer fairly well for a number of the fruits that may be produced in the home orchard or vineyard.

APPLES AND PEARS

Late-maturing varieties of apples and pears may be kept in a storage room in the basement of a dwelling, in outdoor cellars, or in pits, or banks. The length of the storage period will vary with the variety, the temperature of the storage space, and the degree of maturity of the fruit when stored. Ripe fruits will not keep as well as fruits that are mature but firm. Unripened Kieffer pears, for example, require a temperature close to 32° F. for best keeping. If ripe when stored they cannot be expected to remain in good condition for more than 2 or 3 weeks, no matter what the temperature may be. It will usually be desirable to hold early, short-storage varieties in the basement or cellar and late-keeping varieties suitable for spring use in banks, or pits.

Pit storage is suitable for apples and pears only in the northern part of the country, and even there only varieties should be used that are harvested close to the onset of cold weather. These would include such apple varieties as Baldwin, Rhode Island Greening, Northern Spy, and Winesap and such pear varieties as Kieffer, Duchess, Bosc, Comice, Anjou, Easter Beurré, and Winter Nelis. Easter Beurré and Winter Nelis have the best keeping qualities and under proper conditions can be expected to remain in good condition throughout the winter. The other pear varieties cannot usually be kept satisfactorily in pits beyond early winter, even at a temperature close to 32° F.

In northern sections apples intended for pit storage may be kept until freezing weather in a shed or garage, where they will actually be cooler than if placed immediately in a pit or other enclosed storage. In more southerly sections, apples stored in pits would be likely to suffer serious damage from ripening and decay before the weather became cold enough to keep them properly. Where pits are used, only a light covering will be necessary at first, and this can be increased as the weather grows colder. When pears are removed from storage

they should be held at a temperature of 60° to 65° F., in order that they may ripen to best quality for either dessert or canning purposes.

GRAPES

In northern producing sections it is possible to keep grapes for a month or two, provided they are clean and fully ripe and are stored in a cool, moderately moist place. A temperature slightly below 32° F. will do no harm, since grapes freeze at about 28° or lower. The fruit should be held in closed but not airtight containers in a place where it cannot absorb undesirable odors. Among the varieties produced in the East, Catawbas have the best keeping qualities, but other varieties can be kept satisfactorily under the conditions just described.

PLUMS

In the North, plums such as Damson, Italian Prune, Pond ("Hungarian Prune"), and Golden Drop can be held satisfactorily in a moderately moist, cool basement room or storage cellar for a month, possibly 6 weeks. Plums are not adapted to pit storage.

PRODUCE THAT CANNOT BE HELD SATISFACTORILY IN THE HOME STORAGE

The United States Department of Agriculture receives many inquiries from persons who wish to store the surplus of a perishable crop when prices are low and then have it for winter use or for sale when the produce is scarce and prices are higher.

However, it is not possible even in cold storage to hold peaches, tomatoes, peppers, eggplants, and the more common types of watermelons and muskmelons in satisfactory edible condition for more than about a month. For some of these the maximum storage period in a home basement or outdoor cellar would be only a few days and for others possibly 2 weeks. Late in the fall, tomatoes can be kept fairly well for a few weeks by pulling the vines and hanging them in a dry, moderately light place. The ripe fruits can be used at once, and the mature green ones will eventually color and become edible.

STORAGE COMBINATIONS TO BE AVOIDED

Unless storage space is extremely limited, apples should not be stored with cabbages, potatoes, or most root crops, nor celery with turnips or cabbage, because apples and celery will absorb odors from the other produce and so acquire unpleasant flavors. Turnips and cabbage should not be placed in the basement of a dwelling, as they give off odors that penetrate the house.

HOME STORAGE IN CITIES AND TOWNS

Most urban families in the United States purchase their fresh fruits and vegetables in small quantities as needed. In so doing they avoid some loss from decay and other shrinkage, but they also pay more than if they bought in larger quantities, and they are restricted to varieties and kinds carried by hucksters or a local grocery store or food market. It is possible, however, to effect substantial savings and frequently to obtain produce of superior quality by buying in larger quantities on a farmers' or a wholesale market. For produce purchased in this way or for the surplus from a home garden, the most important question to be answered is how and where to store it.

Home storage of vegetables and fruits for protracted periods by residents of cities and towns is sometimes difficult and frequently is impossible. A family living in an apartment may have for storage space only a back porch or a locker room in the basement of the building. The first of these cannot be used for storage of most fruits or vegetables in freezing weather, and the second is likely to be too warm for most produce which it may seem desirable to store. For families living in city or town houses that have back yards, the problem of storage is more easily solved, because it may be possible to use outdoor storage cellars or pits or to wall off part of the basement for a storage cellar. Occasionally there is a root cellar constructed outside the main foundation wall but entered from the basement. For a discussion of storage in such places, see pages 16 to 23.

Any kind of fruits or vegetables available in the fall can be held on a back porch or in a garage for a few weeks; the chief limitations to such storage are those of space and the necessity of accumulating only such quantities as can be used before freezing weather begins if there is no place where they can be stored afterward. Tomatoes, grapes, plums, and early ripening apples and pears are highly perishable under such conditions and will need frequent examination if excessive loss from decay is to be avoided.

In regions where the winters are not severe, late-maturing varieties of apples and pears can be kept satisfactorily on a back porch or in a garage by setting the containers on a thick layer of newspapers and covering them with old rugs, carpets, or newspapers. If a large box is obtainable, this can be heavily lined with newspapers, and filled baskets or hampers can be set inside it, with newspapers stuffed around and over them.

Storage in a locker room in an apartment-house basement may not be practicable. If it is attempted, the chief considerations are to avoid produce likely to give off undesirable odors, such as cabbage, celery, onions, potatoes, rutabagas, and turnips, and to store only produce that will not deteriorate rapidly at temperatures of 50° to 60° F. or even

higher. These limit the storage list to sweetpotatoes, pumpkins, squashes, and fall and winter apples and pears. Probably none of these would be stored in large quantities even if space were available. The maximum storage period for most of them would not be over 2 months and might be much less. Sweetpotatoes will keep well under such conditions for 3 to 4 months or even longer. Care should be taken to have all produce stored free of decay and not seriously damaged by bruises and skin breaks. It should also be protected from rats and mice.

STORAGE IN A HEATED BASEMENT

The chief difficulty in storing vegetables and fruits in the basement of a town or city house is that the basement usually contains a furnace. This means that the temperature during the storage period (50° to 60° F. or even higher) is too high for prolonged storage of most produce and that the air is so dry that excessive shriveling may occur unless precautions are taken to prevent it. Produce that can be stored for various periods in a heated basement or elsewhere in the house is discussed briefly below.

Onions

Onions do not keep well at temperatures likely to occur in a heated basement. However, if mature and thoroughly cured, they will keep for several months in an attic or an unused room where the winter temperature will not go below the freezing point. Under such conditions they are not likely to be seriously objectionable because of their odor. Repeated or severe freezing will injure onions.

Potatoes

Potatoes for current home use are actually of better quality if stored at a temperature of 50° to 60° F. than if stored at 32° to 40°. At the higher temperatures, which are not suitable for long-time storage, potatoes are in no danger of acquiring the undesirable sweetness that develops at temperatures below 40° and they cook better. At time of digging they are in a resting state that persists for a month or 6 weeks under any ordinary conditions to which they are likely to be exposed. During this time they do not sprout. After the rest period is passed, they begin to sprout and the shriveling that may have begun earlier becomes more pronounced. If longer storage is desired, potatoes should be held in a cool but not cold storage cellar where the humidity is fairly high.

Potatoes may be kept in bags, barrels, or boxes; the last two are preferable because they tend to reduce moisture loss.

Pumpkins and Squashes

Pumpkins and winter varieties of squashes can be expected to keep well in a heated basement at a temperature of 50° to 60° F. provided

they are well matured, have been carefully handled, and are free from injury or decay when stored. A preliminary curing at 80° to 85° for about 2 weeks is desirable.

Root Crops

If exposed to the temperatures usually found in a heated basement, root crops cannot be expected to keep satisfactorily for more than 3 or 4 weeks. Shriveling is likely to be severe, especially in turnips (see p. 21), carrots, and beets, but this can be prevented to some extent by storing the roots in damp sand or soil. Care should be taken not to have this material kept too wet; otherwise serious decay is almost sure to result.

In a partitioned-off space to which outside air can be admitted or in an outside root cellar, the storage period may easily be twice that for produce kept in the open basement.

Sweetpotatoes

Sweetpotatoes keep best at a temperature of 55° to 60° F., but they should be given a preliminary curing at a temperature of 80° to 85° for 10 to 14 days. The curing of late-crop sweetpotatoes can be done very easily in a heated basement by placing the roots in trays that are set on the hot-water pipes or near the furnace for the necessary length of time (fig. 22). The curing temperature should not exceed 85°. Covering the containers with newspapers, bags, or carpet will help to keep the roots from drying out too fast during the curing treatment. Afterward they can be held satisfactorily for several months in boxes or barrels in the open basement. Storage temperatures below 55° are not desirable for sweetpotatoes, as decay is likely to set in.

Apples and Pears

Fall and winter varieties of apples and pears can be kept in a heated basement for a month to possibly 6 weeks, depending on the variety. Baldwin, York Imperial, and Winesap apples and Kieffer pears, for example, will remain in usable condition longer than Grimes Golden apples or Seckel pears. They should all be looked over carefully before storage, in order to remove fruits that are bruised or cut or affected by decay. Barrels or boxes make the best containers, and these should be kept covered, though not necessarily tightly lidded, to reduce moisture loss and prevent accumulation of dust on the fruit. Occasional inspection of at least the upper layers of fruit in the containers is advisable, to forestall the development of serious decay.

STORAGE IN AN UNHEATED BASEMENT

Temperature and humidity conditions in an unheated basement are similar to those in the specially constructed storage cellars. (See pp.

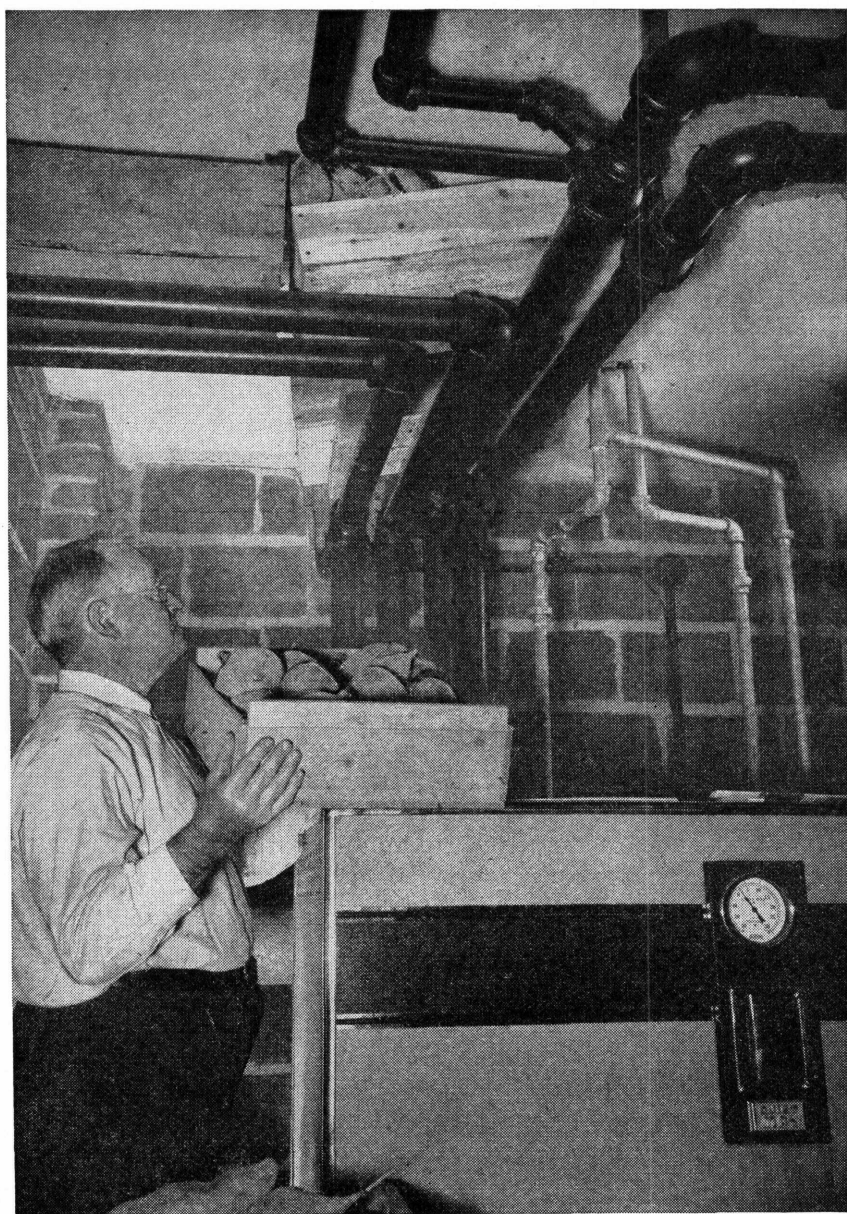


FIGURE 22.—Sweetpotatoes are easily cured if placed on hot-water pipes in shallow boxes for about 2 weeks.

3 to 12.) Consequently such a basement is well suited for the storage of potatoes (p. 20), root crops (p. 21), or late-maturing varieties of apples and pears (p. 23). The only precaution to be observed is to provide such insulation or other protection as may be necessary to keep the produce from freezing. Precautions against freezing will, of course, need to be more thorough in regions having severe winters than in those where the winters are fairly mild. In the latter it will usually be sufficient to cover the produce with old rugs or carpet or several layers of newspapers.

SUMMARY OF STORAGE RECOMMENDATIONS

The general storage recommendations for the various commodities are summarized in tables 1 and 2.

TABLE 1.—*Places recommended for home storage of vegetables and fruits*

Commodity	Place to store
Vegetables:	
Dry beans and peas.....	Any cool dry place.
Late cabbage.....	Pit, trench, or outdoor cellar.
Late celery.....	Pit or trench; roots in soil in storage cellar.
Endive.....	Roots in soil in storage cellar.
Onions.....	Any cool dry place, above freezing.
Parsnips.....	Where they grew, or in soil in storage cellar.
Various root crops.....	Pit or in soil in storage cellar.
Potatoes.....	Pit or storage cellar.
Pumpkins and squashes.....	Moderately dry, fairly cool cellar or basement (see text).
Sweetpotatoes.....	Moderately dry, fairly cool cellar or basement.
Fruits:	
Apples.....	Storage cellar, pit, or basement (see text).
Pears.....	Storage cellar (see text).
Grapes.....	Basement or storage cellar.
Plums.....	Do.

TABLE 2.—*Length of storage period and recommended temperature and humidity for home storage of vegetables and fruits*

Commodity	Length of storage period	Temperature	Humidity
Vegetables:			
Dry beans and peas.....	As long as desired.....	Cool.....	Dry.
Late cabbage.....	Through late fall and winter.	Cool; avoid severe freezing.	Moderately moist.
Cauliflower and broccoli.....	2 to 3 weeks.....	32° F.....	Do.
Late celery.....	Through late fall and winter.	Cool; avoid freezing.....	Moist.
Endive.....	2 to 3 months.....	Cool.....	Do.
Onions.....	Through fall and winter.	do.....	Dry.
Parsnips.....	do.....	Cold; freezing does not injure.	Moderately moist.
Various root crops.....	do.....	Cool; avoid freezing.....	Do.
Potatoes.....	do.....	See text; avoid freezing.	Do.
Pumpkins and squashes.....	do.....	50° to 60° F.....	Moderately dry.
Sweetpotatoes.....	do.....	55° to 60° F.....	Do.
Fruits:			
Apples and pears.....	See text.....	Cool.....	Moderately moist.
Grapes.....	1 or 2 months.....	do.....	Do.
Plums.....	4 to 6 weeks.....	do.....	Do.

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